Scottish Intercollegiate Guidelines Network

69 Management of obesity in children and young people

A national clinical guideline

April 2003

KEY TO EVIDENCE STATEMENTS AND GRADES OF RECOMMENDATIONS

LEVELS OF EVIDENCE

1^{++}	High quality meta-analyses, systematic reviews of randomised controlled trials (RCTs), or RCTs with a very low risk of bias
1^{+}	Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
1^{-}	Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias
2^{++}	High quality systematic reviews of case control or cohort studies High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
2^{+}	Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2^{-}	Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3	Non-analytic studies, e.g. case reports, case series
4	Expert opinion

GRADES OF RECOMMENDATION

Note: The grade of recommendation relates to the strength of the evidence on which the recommendation is based. It does not reflect the clinical importance of the recommendation.

A	At least one meta-analysis, systematic review of RCTs, or RCT rated as 1^{++} and directly applicable to the target population*; or* A body of evidence consisting principally of studies rated as 1^{+}, directly applicable to the target population, and demonstrating overall consistency of results
B	A body of evidence including studies rated as 2^{++}, directly applicable to the target population, and demonstrating overall consistency of results*; or* Extrapolated evidence from studies rated as 1^{++} or 1^{+}
C	A body of evidence including studies rated as 2^{+}, directly applicable to the target population and demonstrating overall consistency of results*; or* Extrapolated evidence from studies rated as 2^{++}
D	Evidence level 3 or 4*; or* Extrapolated evidence from studies rated as 2^{+}

GOOD PRACTICE POINTS

☑	Recommended best practice based on the clinical experience of the guideline development group

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1 Introduction

1.1 THE NEED FOR A GUIDELINE

Obesity is an increasingly common problem in children and young people and is difficult to treat. Children and young people were not addressed in the previous SIGN guideline on obesity,[1] and at present no evidence based guideline exists. Diagnosis of obesity in childhood is less robustly performed than for adults, and this has led to a wide variation in practice. Some large children have been labelled as obese and had needless referral and treatment, whereas some very obese children have not been recognised as being at risk nor had appropriate referral. The adverse consequences of childhood obesity, such as development of hypertension, hyperlipidaemia and type 2 diabetes, are under-recognised, as is the tendency for childhood obesity to persist into adult obesity. The prevention of childhood obesity is not adequately addressed despite a rapid rise in its prevalence. Treatments have only limited success, resulting in a negative approach to treatment strategies. In light of these issues, there is an urgent need for an evidence based guideline for clinical practice.

1.2 REMIT OF THE GUIDELINE

This guideline aims to provide recommendations based on current evidence for best practice in the management of obesity in children and young people, up to the age of 18. The definition of childhood obesity is reviewed, and information on both the prevalence of childhood obesity in the UK, and recent trends in the prevalence of obesity, are presented. The immediate consequences of obesity in childhood and possible consequences in adulthood are identified, as are subgroups of children at high risk of developing obesity. Preventive interventions for childhood obesity are also reviewed. The treatment of childhood obesity and the goals of therapy, particularly management in the community and management beyond primary care are discussed along with advice on healthy eating.

Many aspects of the management of childhood obesity have either not been subject to systematic evaluation, or have limited robust evidence to support recommendations. Therefore recommendations for research have been made throughout the document. The guideline development group recognises that monitoring of potential adverse effects of interventions should be part of any trials of treatment or prevention.

Appraising the role of screening for obesity in children was not within the remit of this guideline.

1.3 CHILDHOOD OBESITY IN CONTEXT

Obesity in children is different from obesity in adults in some important respects. The main difference is that all children and adolescents need to grow; for example during puberty, a child's weight will double and their height increase by 20%. This has obvious consequences for the diagnosis, prevention and treatment of obesity in childhood. Simple measures of obesity such as the body mass index (BMI) cannot be used in isolation, instead they should be expressed as a BMI percentile in relation to an age and sex matched population. When considering the prevention and treatment of childhood obesity, dietary energy restriction, increases in activity and decreases in sedentary behaviour must not compromise normal growth and development. For these reasons, weight maintenance is often a suitable goal, rather than weight loss. Gradual, measured and sustainable weight loss may be an appropriate target in some cases.

The aetiology of obesity lies in deranged energy balance. If adults are in energy balance, they will neither gain nor lose weight. In children, growth is only possible if energy intake (as food and drink) exceeds energy output (resting metabolic rate and activity). Excess energy is stored in new tissue. With increasing degrees of positive energy balance, excess adipose tissue will be formed and stored.

In the United Kingdom, a rapid rise in the prevalence of obesity has occurred, mainly due to environmental and behavioural changes relating to diet and inactivity. Although data from the

National Food Survey[2] show that household energy intakes have fallen since 1970, there has been a concomitant change in the type of food consumed. In particular there has been an increased intake of high fat foods. These are readily available, very palatable and energy-dense, but may not satisfy the appetite as quickly as high carbohydrate foods.

The marked rise in obesity prevalence has coincided with a major change in how children spend their time, resulting in both a decrease in physical activity and a rise in sedentary behaviour.[3] The causes of this behaviour change are complex and cumulative. For many there has been a general reduction in activity during daily living (for example, less walking, greater use of cars, more use of escalators and lifts), and also reductions in the amount of physical education and sport carried out at school and at home. The marked rise in sedentary behaviour is associated with increased time spent watching television, playing computer games, surfing the internet and using the telephone.

There may be a wider societal and political context to these changes.This includes, for example; the loss of school playing fields; the lack of a safe environment in which to walk or cycle to school or for physical play at the home; transport policies that favour driving above cycling or walking; a food industry that targets children with advertisements for high energy foods, and health promotion policies that fail to target appropriate dietary change or address issues of health inequality. The guideline development group is aware of these issues, but did not find any policy interventions, either at local or national level, that could be studied within the confines of an evidence based guideline. The group hopes that this guideline can inform the debate on the rising prevalence and adverse health consequences of childhood obesity, and lead to appropriate multi agency working locally, and active involvement and consultation between public health, education and environment departments at a national level. It is important, however, that any policy intervention is evidence based and appropriately evaluated prior to widespread introduction.

1.4 TARGET AUDIENCE

The target audience for this guideline is those in primary care who care for children with obesity, plus those in secondary and tertiary care to whom children with obesity may be referred:

- general practitioners (GPs)
- health visitors
- practice nurses
- hospital and community dietitians
- consultant hospital and community paediatricians and physicians
- junior doctors
- clinical psychologists
- play therapists.

Although dietitians, GPs and physicians are particularly targeted, the guideline is also relevant to those with a nutrition interest, for example, the school health service (nurses and doctors), and those in education, such as the school meals service, PE teachers and local authority planners of nursery services. This is a social issue rather than a purely medical one and the management is largely outside the surgery.

2 Definitions and prevalence

2.1 DEFINITION OF CHILDHOOD OBESITY

An ideal tool to assess obesity in children would simply and rapidly identify those with excess body fat who are at risk of morbidity. For adult practice[4] there is widespread agreement on use of the Body Mass Index (BMI: weight in kilograms divided by the square of height in metres: kg/m^2), with a simple definition of obesity as BMI >30.0 kg/m^2. For children and young people (those aged <18 years), BMI is not a static measurement, but varies from birth to adulthood, and is different between boys and girls. Interpretation of BMI values in children and young people therefore depends on comparisons with population reference data, using cut-off points in the BMI distribution (BMI percentiles). Despite these limitations, there is widespread international support for the use of BMI to define obesity in children, expressed in non-systematic reviews and consensus statements.[5-13] 3 4

The value of BMI as a measure of childhood obesity has been assessed in clinical and anthropometric studies, of which two contain British data.[14-19] The effectiveness of BMI as a screening tool to identify the fattest children correctly has been assessed by comparisons against reference measures of body fatness, such as hydrodensitometry and dilution of the stable isotopes deuterium and oxygen-18. [20-28] 2++ 2+

Use of cut off ranges for BMI is associated with high specificity and moderate sensitivity for identifying the fattest children, particularly when the cut off is greater than the 90th centile.[20] These cut-offs are also clinically meaningful: obesity defined in this way is associated with short and long term morbidity (eg tendency for obesity to persist,[29] presence and clustering of cardiovascular risk factors).[30,31] 3

The remit of this guideline is to recommend an evidence based means of diagnosing obesity in children in Scotland. The recommendations are intended primarily for clinical purposes such as diagnosing a child as obese in order to treat or refer for treatment. Described below are two recent developments that may in time have widespread applicability for diagnosis of childhood obesity, but currently do not have an evidence base to assess for routine use. To assess their value will require evidence on external validity, particularly in relationship to morbidity and diagnostic utility.

- 'International' cut-offs for BMI have recently been proposed for worldwide epidemiological comparisons of childhood obesity prevalence.[6] One UK study found that the ability of the 'international' definition to identify the fattest children was poor (low sensitivity) compared to the UK 1990 reference data for BMI.[16]
- Waist circumference has a role in diagnosis of adult obesity but there is no current evidence on its diagnostic value in childhood. At present it cannot be recommended as a means of diagnosing childhood obesity, as there is no clear threshold for waist circumference associated with morbidity outcome in children.

Research recommendation: A large, nationally representative, study of the diagnostic utility of both international cut-offs and waist circumference compared to the UK 1990 reference data for BMI should be performed.

D **Obesity should be identified by objective (anthropometric) means.**

C **The Body Mass Index percentile should be used to identify childhood obesity.**

An on line BMI calculator is available at: http://www.hebs.scot.nhs.uk/learningcentre/weightmanagement/bmi.htm and is accompanied by advice on interpreting BMI in children: http://www.hebs.scot.nhs.uk/learningcentre/weightmanagement/childhood/2.2.htm

These links were correct at the time of publication, but please check the SIGN website for updates.

2.1.1 DIAGNOSIS OF OBESITY

The majority of published epidemiological work has used a definition of obesity as BMI ≥95th centile of the 1990 reference chart for age and sex and for comparative epidemiological purposes it is important to retain this definition. This definition has high specificity (it diagnoses few lean children as obese) but moderate sensitivity (that is, will fail to diagnose many of the fattest children as obese).[15-28] As a diagnostic tool high specificity has been regarded as paramount since it reduces the likelihood that treatment will be offered to children who are not actually obese.[8,11] The UK 1990 reference charts for BMI centiles for boys and girls give the 91st and 98th centile lines. For routine clinical use, the 98th centile is the recommended cut-off value defining obesity *(see Annex 1)*. This is a pragmatic choice based on charts that are well accepted and widely available, and in this context means the UK 1990 reference charts for BMI centiles for children.[5]

2++ 3

D **For clinical use, obese children are those with a BMI ≥98th centile of the UK 1990 reference chart for age and sex.**

☑ For clinical use, overweight children are those with a BMI ≥91st centile of the 1990 reference chart for age and sex.

These clinical definitions conflict with the majority of international literature, which has used a definition of BMI ≥85th centile of reference data for overweight and BMI ≥95th centile of reference data for obesity. It is important to maintain epidemiological definitions which are consistent with current literature. In future this may include the international cut-off values.[6]

D **For epidemiological (research) purposes:**

- **overweight should be defined as BMI ≥85th centile of the 1990 reference data**
- **obesity should be defined as BMI ≥95th centile of the 1990 reference data**

for age and sex.

☑ The UK 1990 reference data for BMI in childhood[5] are recommended for clinical and epidemiological practice in the UK. BMI should be plotted at the correct age on a sex appropriate chart.

See Annex 1 and www.hebs.com/learningcentre/weightmanagement

2.1.2 TERMINOLOGY

The term "BMI ≥98th centile" is used throughout this guideline as a shorthand for BMI ≥98th centile of the UK 1990 reference chart.[5]

2.2 PREVALENCE

There is a worldwide concern about the increasing prevalence of obesity in childhood, as well as in adult life. By 1991, almost one in five children in the USA was overweight.[32]

2.2.1 PREVALENCE OF CHILDHOOD OBESITY IN THE UK

There have been six recent British surveys of childhood obesity, three of which have been broadly nationally representative[33-35] one regionally representative,[36] and two surveys set in English towns.[37,38] The only published Scottish prevalence data are found within the National Study of Health and Growth.[33,39] All have indicated a higher prevalence of obesity in childhood than expected from the 1990 data for example; 11% of 6 year olds and 17% of 15 year olds in the Health Survey for England 1996 had a BMI >95th centile relative to the UK 1990 reference data.[35]

2+ 3

Research recommendation: A large, nationally representative, survey of obesity prevalence in Scottish children urgently needs to be performed.

2.2.2 PREVALENCE TRENDS

The prevalence of obesity has increased in British children.

An advantage of five of the surveys noted above[34-38] is that they compare BMI in British children in the period 1993 to1996 with the UK 1990 reference data.[5] Given that only 5% and 2% of children should be respectively above the 95th and 98th centiles, the increasing excess above these levels suggest a marked secular trend to an increase in the prevalence of obesity. This is confirmed by the NSHG study,[39] which has shown a marked increase in fatness (measured by triceps and subscapular skinfold thicknesses) in English and Scottish schoolchildren from 1972 to 1994. The increase in obesity has also been demonstrated using the international cut-off values[6] in a subset of the NSHG data.[33]

2+
3

Research recommendation: Ongoing national surveys of the prevalence of obesity in British children should be conducted, with the UK 1990 reference data for BMI taken as the comparator.

3 Consequences of childhood obesity

Many good quality cohort or case control studies have addressed the relationship between obesity in child and adulthood and adverse cardiovascular events. The main body of evidence is from the United States. Only one European study was identified and no UK studies were found. With the exception of studies involving African-American or Far Eastern patients, all studies identified were felt to be relevant and applicable to the Scottish population.

3.1 IMPACT ON THE CHILD

3.1.1 CARDIOVASCULAR RISK FACTORS, METABOLIC AND ENDOCRINE COMPLICATIONS

Cohort and case control studies provide good evidence of an association between childhood obesity and cardiovascular and other risk factors. The at-risk population is large and is increasing, as illustrated by the "obesity epidemic" in the USA and the subsequent increase in the prevalence of adolescent type 2 diabetes.[40] Although studies contain little direct evidence regarding the benefit of intervention and/or prevention, most infer that early intervention and/or prevention would be beneficial.

There is much interest in differential risk for the cardiovascular and endocrine complications of childhood obesity amongst different ethnic populations in the UK. There is however, little high quality published evidence in childhood to date.[41] American post mortem studies for example have demonstrated consequences of childhood obesity such as atherosclerosis[42] and coronary artery disease. 3

The main cardiovascular consequences of childhood obesity that occur during childhood are subclinical coronary artery disease and atherosclerosis.[42-44] 2++

Several cardiovascular risk factors have been shown to be associated with childhood obesity;
- increased blood pressure[42,43,45]
- adverse lipid profiles[31,32,42,45-51]
- adverse changes in left ventricular mass[52]
- hyperinsulinaemia.[46,53,54]

2++

Cardiovascular risk factors in children and adolescents are also related to:
- central adiposity[31,32,54]
- a family history of coronary artery disease.[55]

Childhood obesity is also associated with significant 'clustering' of cardiovascular risk factors[30,31] (where clustering is defined as the strong tendency for obese children to have more than one cardiovascular risk factor). As with adult obesity, clustering of risk factors increases risk.[42]

☑ Healthcare professionals should be aware that the following risk factors for coronary artery disease and atherosclerosis are relatively common in obese children and adolescents:
- increased blood pressure
- adverse lipid profiles
- changes in left ventricular mass
- hyperinsulinaemia.

For pragmatic reasons, measurement of blood pressure, lipids etc may only be possible following referral to secondary care *(see section 5.2)*.

3.1.2 PSYCHOLOGICAL CONSEQUENCES

Obese children are more likely to show evidence of psychological distress than are non-obese children and the effect is greater for girls than boys.[56,57] Obesity in childhood and adolescence is also associated with poor self esteem,[56,58] being perceived as unattractive,[59] depression,[60] disordered eating[57,61] bulimia and body dissatisfaction.[62] Psychosocial distress and psychiatric disorders in children may be more associated with parental psychological/psychiatric problems than the child's own BMI, age or sex.[63] 2+

☑ Obese children showing signs of distress and their families should be considered for referral for psychological assessment and treatment.

See section 5.2.2 for additional referral advice.

Research recommendation: the prevalence and degree of psychological complications of obesity in children in the UK needs to be defined in a well designed cohort study.

3.1.3 OTHER MEDICAL CONSEQUENCES

Obesity in childhood may be a chronic inflammatory condition, as shown by increased levels of C-reactive protein [64-66] and is associated with a number of potential comorbidities: 2+

- the risk of developing asthma and the exacerbation of pre-existing asthma[67-71]
- abnormalities of foot structure and function[72]
- increased risk of type 1 diabetes.[73]

3.2 IMPACT ON THE ADULT

Obesity in childhood appears to predispose a child to medical problems as an adult.

3.2.1 CARDIOVASCULAR RISK FACTORS

In many of the studies evaluated, the consequences of childhood obesity for the adult were frequently and reasonably extrapolated from risk associations in childhood. Evidence suggests that risk factors present in the child are carried into adulthood, in particular, effects on blood pressure,[43,42,74] lipid profiles[30,31,42,46,74,75] and insulin and glucose synthesis. 2++

3.2.2 LONG TERM MORBIDITY AND MORTALITY

A cohort study in Dutch men has demonstrated an increased 32-year mortality risk (relative risk 1.95, confidence intervals 1.41 - 2.69) for men with BMI ≥26 at age 18 years.[76] 2++

3.2.3 SOCIOECONOMIC ASSOCIATIONS

Two good quality studies, one from the UK and one from the USA[77,78] show adverse associations between childhood obesity and educational attainment and income in women. 2+

3.3 DO OBESE CHILDREN BECOME OBESE ADULTS?

There does appear to be a tendency for childhood obesity to persist into adult obesity, although no evidence was identified to demonstrate a direct link between the two. This tendency is strengthened when one parent is obese and further strengthened when both parents are obese. Cohort data also support the existence of such a link.[47,74,75,79,80] The likelihood of persistence of obesity to adulthood increases with age of the child and with severity of the obesity.[29,81-83] 2++ 2+

C **Prevention and treatment of obesity should be initiated in childhood.**

C **Parental obesity should be recognised as a risk factor for childhood obesity to persist into adulthood.**

4 Prevention

4.1 CHILDREN AT HIGH RISK OF DEVELOPING OBESITY

The search for evidence delineating subgroups of children in the UK at high risk of developing obesity focused on studies performed in the UK, so limiting culture and population specific factors to those relevant in the UK. It was also confined to studies after 1990, when the "epidemic" of childhood obesity in the UK became obvious.[33,35,39] Although obesity is a direct consequence of certain childhood syndromes (for example Prader-Willi syndrome) or childhood diseases (such as hypothyroidism), these account for a tiny proportion of obese British children, and were not considered further.

4.1.1 SOCIOECONOMIC STATUS

Only one published study in the UK has evaluated the relationship between prevalence of childhood obesity (defined as BMI >98th centile) and deprivation (defined by Townsend score), and was a survey of 5 to14 year olds from 1994 to 1996 in Plymouth.[37] It found a significant relationship between degree of deprivation and increased prevalence of childhood obesity. | 3

4.1.2 GENDER

Two national surveys,[33,35] two regional cohort studies,[34,36] and two local studies[37,38] have evaluated the relationship between gender and childhood obesity. None found any marked gender difference in the prevalence of obesity. | 2+ 3

4.1.3 AGE

In three cohort studies and three surveys,[33-38] obesity was found to be more prevalent with increasing age in British children. | 2+ 3

4.1.4 PARENTAL OBESITY

No published, recent, UK study has evaluated the role of parental obesity as a risk factor for childhood obesity in a cohort or cross-sectional survey.

4.1.5 DIET

No published UK study has evaluated the role of diet in a cohort of children prior to the development of obesity.

4.1.6 PHYSICAL ACTIVITY

No published UK study has evaluated the role of physical activity in a cohort of children prior to the development of obesity.

4.1.7 PHYSICAL INACTIVITY AND TELEVISION VIEWING

There is increasing evidence[84,85] that physical inactivity, particularly increased TV viewing, is a risk factor for the development of obesity in children and adolescents. There are currently no published studies on this topic from the UK.

4.1.8 SUMMARY

In the UK, the prevalence of obesity increases with age through childhood and adolescence, and there is no evidence of any marked difference in prevalence between boys and girls. Limited survey data suggest that the prevalence of obesity rises with increasing socioeconomic deprivation. No study has appropriately examined specific environmental factors, such as low habitual physical activity and inappropriately high habitual energy intake, which are believed to have causal roles in the current epidemic of childhood obesity.

Research recommendation: There is a need for research on risk factors for obesity in contemporary British children.

4.2 PREVENTIVE INTERVENTIONS FOR CHILDHOOD OBESITY

For an intervention to be effective in preventing childhood obesity, it must have been evaluated in a general population of children. Inclusion criteria for studies to be evaluated were both a randomised controlled trial study design and a duration of follow up of the intervention of at least 12 months. These are different inclusion criteria than those of the Cochrane review of interventions for preventing obesity in children.[86]

Only four studies, three from the USA, fulfilled the inclusion criteria[87-90] and cultural differences may limit their generalisability to British children. Most studied large numbers of school children and had complex intervention packages. Only one of these studies was of high methodological quality, the "Planet Health" trial.[87] This was a complex intervention which focussed largely on changing the school environment over two school years. The multiple interventions used in these studies included decreased television viewing, increased physical activity, decreased fat intake, increased fruit and vegetable intake, altered class curricula, and teaching of families, and would have major resource implications for public health if replicated in full. In Planet Health there was a significant reduction in obesity risk for girls (Absolute risk reduction 0.47, 95% Confidence Intervals 0.24-0.93) and a significant remission of existing obesity among girls (Absolute risk reduction 2.16, 95% Confidence Intervals 0.7-4.35). The trend in boys was in the same direction, but did not reach significance. The authors reported evidence that the effect observed was largely attributable to observed reductions in television viewing. In the only British study, the only positive outcome was a modest increase in the consumption of vegetables.[88]

1+
1-

C **School, family and societal interventions should be considered for the prevention of obesity in children.**

Research recommendation: Large well designed (following the CONSORT principles)[91] obesity prevention studies are urgently needed in the UK.

5 Treatment

5.1 TREATMENT OF CHILDHOOD OBESITY

For an intervention to be effective in the treatment of childhood obesity, it must be evaluated in a group that is already obese. Inclusion criteria for studies to be evaluated were both a randomised controlled trial study design and a duration of follow up of the intervention of at least 12 months.

Eighteen RCTs that fulfilled the inclusion criteria were identified mainly from the USA.[92-109] Eight of these trials came from the same research group and all 18 had major methodological flaws.

Common problems were lack of details about the randomisation process, lack of blinding, lack of sample size calculation, very small numbers of subjects, differing treatments of groups other than just that treatment being investigated, high attrition rates, and lack of intention to treat analysis. Further, many diverse interventions were studied, although most fell into the categories of dietary modification, exercise programmes, and behavioural management. The evidence however, does suggest that reduction of energy intake by dietary change, and increasing energy expenditure by reducing sedentary behaviour, involvement in exercise programmes or alterations in lifestyle may lead to long term successful treatment for childhood obesity. 1-

☑ Increases in activity, through lifestyle changes and exercise, reduction in energy intake and reduction in sedentary behaviour should be considered for the treatment of obesity.

Research recommendation: Well designed intervention studies (following the CONSORT principles)[91] among obese children are urgently needed in the UK.

Parents and health professionals may be concerned that treating childhood obesity increases the risk of developing eating disorders, but the evidence for such an association is equivocal.[110]

Very few of the studies addressed family issues, especially family based behavioral change or support of the family during long term treatment. Given that many of the intervention packages were complex, required multiple healthcare professionals, and were performed in specialised North American clinics, the results may be neither generalisable nor applicable to the treatment of childhood obesity in primary care in the UK.

Should practitioners focus on behavioural change; medical outcomes; weight loss or weight maintenance? Whichever approach, or combination of approaches is taken, the importance of prevention should not be neglected. Preventing obesity has many advantages given the limited evidence on the efficacy of treatment, the limited resources available for treatments, and the strong evidence of the adverse effects of child and adolescent obesity *(see section 3)*.

Evidence in this area has been difficult to identify. In the absence of individual trials, recommendations were based on the advice of the US Expert Committee.[11] Although this statement was intended for the American population, in view of the high prevalence of overweight in children and young adults in Scotland and the potential clinical impact, it was felt reasonable to generalise from this.

5.2 TREATMENT IN THE COMMUNITY

Most children managed in the community will have 'simple' obesity with no underlying medical cause, and many will not have comorbidity. The following recommendations are based on the advice of the US Expert Committee.[11] Treatment should only be offered under specific circumstances, as weight management programmes for those not ready to change are likely to be time consuming, futile, and may even be harmful. 4

D **Treatment should only be considered where:**

- **a child is defined obese** (BMI ≥98th centile) **and**
- **the child and family are perceived to be ready and willing to make the necessary lifestyle changes.**

5.2.1 WEIGHT MAINTENANCE

For children who are overweight and most children who are obese, weight maintenance is an acceptable goal. In time it is hoped that, to some degree, overweight and obese children might 'grow into their weight'.[11] As a strategy, weight loss (as distinct from weight maintenance) should be limited to those children being cared for by secondary care services. 4

D **In most obese children** *(BMI ≥98th centile)* **weight maintenance is an acceptable goal.**

☑ The benefits of weight maintenance should be demonstrated to families by charting weight over time on the BMI percentile chart.

D **Weight maintenance and/or weight loss can only be achieved by sustained behavioural changes, eg:**

- **healthier eating** *(see Annex 2)*
- **increasing habitual physical activity** *(eg brisk walking)* **to a minimum of 30 mins day. In healthy children, 60 minutes of moderate-vigorous physical activity/day has been recommended[111]**
- **reducing physical inactivity** *(eg watching television and playing computer games)* **to <2 hours/day on average or the equivalent of 14 hours/week.**

Possible approaches to implementing behavioural changes include:

- encouraging children and their families to make a few small, permanent changes in behaviour at a time
- developing family awareness of eating, activity, and parenting behaviours
- encouraging a family to improve their monitoring of their eating and activity habits *(see section 6).*

Practitioners may be asked to give advice on managing overweight children. As with obese children, weight maintenance is an acceptable goal for children who are overweight.

D **In overweight children** *(BMI ≥91st centile)* **weight maintenance is an acceptable goal. Annual monitoring of BMI percentile may be appropriate to help reinforce weight maintenance and reduce the risk of children becoming obese.**

5.2.2 WHEN TO REFER

Formal trials of the impact of different referral criteria are not easily carried out and only an expert committee statement was identified.

Following the advice of the US Expert Committee,[11] the following criteria for referral to a hospital general paediatric or community clinic for children and young people are recommended. 4

D **The following groups should be referred to hospital or community paediatric consultants before treatment is considered:**

- **children who may have serious obesity-related morbidity that requires weight loss** *(eg benign intracranial hypertension, sleep apnoea; obesity hypoventilation syndrome, orthopaedic problems and psychological morbidity)*
- **children with a suspected underlying medical** *(eg endocrine)* **cause of obesity including all children under 24 months of age who are severely obese** *(BMI ≥99.6th centile)*
- **all children with BMI ≥99.6th centile** *(who are at higher risk of obesity-related morbidity)*

☑ Suspect an underlying medical cause of obesity if a child is obese and also short for their age.

See section 3.1.2 for advice on referral for psychological distress.

5.2.3 ROLE OF SECONDARY CARE

The primary purposes of referral are to exclude underlying medical causes of obesity and to treat comorbidity. Most patients will not have an underlying medical cause and should be discharged back to management in the community.

In patients with no underlying medical causes but with serious obesity-related comorbidity, treatment of the comorbidity may be indicated. In many cases (eg type 2 diabetes), such treatment will be enhanced by weight management. In secondary care, treatment should follow the principles outlined above, but weight loss, rather than weight maintenance may be the appropriate aim *(see section 5.2.1)*.

D **For obese children over the age of seven years, who can demonstrate prolonged weight maintenance and who are cared for by secondary care services, modest weight loss (no more than 0.5kg/month) is an acceptable goal.**

☑ Patients should be assessed for medical causes of obesity and existing comorbidities. Where these exist, weight loss is indicated, and specialist referral may be appropriate.

☑ Where there is no underlying medical cause of obesity, patients should be referred back to primary care with the maintenance/prevention message reinforced.

No formal assessment of the role of residential weight loss camps has been made due to a lack of evidence which met inclusion criteria.

No evidence on drug or surgical treatment of paediatric obesity met inclusion criteria and no drug is licensed currently for the treatment of obesity in children in the UK.

6 Key messages for patients and parents

These key messages are not intended for direct dissemination to patients, but are provided for possible use by clinicians in discussing treatment options with patients and their parents. They may be incorporated into local patient information materials.

See Annex 2 for advice on healthy eating and changing behaviour.

- Obesity in children is becoming more common.
- Obesity is due to an imbalance between energy consumption and energy expenditure. Obese children do not have low energy needs. They have high energy needs to support their high body weight.
- Obesity is a health concern in itself and also increases the risk of other serious health problems such as high blood pressure, diabetes and psychological distress.
- An obese child tends to become an obese adult.
- There is no evidence that any drug treatment is effective in treating obesity in children.
- Obesity in children may be prevented and treated by making lifestyle changes such as:
  - increasing physical activity
  - decreasing physical inactivity (eg TV watching)

  and
  - encouraging a well balanced and healthy diet
- Lifestyle change involves making small gradual changes to behaviour.
- Family support is necessary for treatment to succeed.
- Generally, the aim of treatment is to help children maintain their weight (so they can "grow in to it").
- A medical cause of obesity is more likely in the child who is obese and short for their age.
- Most children are not obese because of an underlying medical problem but as a result of their lifestyle.

7 Development of the guideline

7.1 INTRODUCTION

SIGN is a collaborative network of clinicians, other health care professionals, and patient organisations, funded by NHS Quality Improvement Scotland. SIGN guidelines are developed by multidisciplinary groups of practising clinicians using a standard methodology based on a systematic review of the evidence. Further details about SIGN and the guideline development methodology are contained in "SIGN 50: A guideline developer's handbook", available at **www.sign.ac.uk**

7.2 THE GUIDELINE DEVELOPMENT GROUP

Dr David Wilson (Chairman)	*Consultant and Senior Lecturer in Paediatric Gastroenterology and Nutrition, University of Edinburgh and Royal Hospital for Sick Children, Edinburgh*
Dr David Alexander	*General Practitioner, Dunfermline*
Ms Francesca Chappell	*SIGN Information Officer*
Dr Ann Dunbar	*General Practitioner, Borders*
Dr Belinda Hacking	*Consultant Clinical Psychologist, Lothian University Hospitals NHS Trust*
Dr Cathy Higginson	*Research Specialist, Health Education Board Scotland*
Ms Christine Hinch	*Health Visitor, Glasgow*
Dr Chris Kelnar	*Consultant Paediatric Endocrinologist and Reader in Child Health, Royal Hospital for Sick Children, Edinburgh*
Dr Zoe McDowell	*Senior House Officer, The Royal Hospital for Sick Children, Yorkhill,Glasgow*
Mrs Emily Methven	*Practice Nurse, Lanarkshire*
Dr Safia Qureshi	*Programme Director, SIGN*
Dr Beth Rimmer	*Medical Prescribing Adviser to the Western Isles*
Dr John Reilly	*Reader in Paediatric Energetics, The Royal Hospital for Sick Children, Yorkhill,Glasgow and University of Glasgow*
Mrs Laura Stewart	*Community Paediatric Dietitian, Royal Hospital for Sick Children, Edinburgh*
Dr Carolyn Summerbell	*Reader in Human Nutrition, University of Teeside*
Mrs Michelle Wilson	*Research Associate, University of Edinburgh and Royal Hospital for Sick Children, Edinburgh*
Mr Mehran Zabihollah	*Health Economist, St Andrew's University*

The membership of the guideline development group was confirmed following consultation with the member organisations of SIGN. There are no national support organisations for childhood obesity, so no patient or family representatives could be included in the group. Declarations of interests were made by all members of the guideline development group. Further details are available from the SIGN Executive.

7.3 SYSTEMATIC LITERATURE REVIEW

The evidence base for this guideline was synthesised in accordance with SIGN methodology. A systematic review of the literature was carried out using an explicit search strategy devised by the SIGN Information Officer in collaboration with members of the guideline development group. The search for systematic reviews and meta-analysis covered the Cochrane Library, MEDLINE, EMBASE, CINAHL and HEALTHSTAR databases, and the internet, from January 1991 to December 2001. The search for randomised controlled trials, cohort studies, case control studies, and cross-sectional surveys covered the Cochrane Library, MEDLINE, PUBMED, EMBASE and CINAHL databases, and the internet, from January 1981 to December 2001. The evidence base was updated during the course of development of the the guideline, and the search was supplemented by reviewing references identified from papers from the searches, from personal databases, and from hand searching of the obesity journals.

7.4 CONSULTATION AND PEER REVIEW

7.4.1 NATIONAL OPEN MEETING

A national open meeting is the main consultative phase of SIGN guideline development at which the guideline development group presents its draft recommendations for the first time. The national open meeting for this group was held on 18th September 2001. The meeting was attended by 218 representatives of the key specialties relevant to this guideline, including mothers of children with obesity. The draft was also available on the SIGN website for a limited period at this stage to allow those unable to attend the meeting to contribute to the development of the guideline.

7.4.2 SPECIALIST PEER REVIEW

The guideline was also reviewed in draft form by a panel of independent expert referees, who were asked to comment primarily on the comprehensiveness and accuracy of interpretation of the evidence base supporting the recommendations in the guideline. SIGN is very grateful to all of these experts for their contribution to this guideline.

Dr Jane Austin	*Community Paediatrician, Highland Primary Care NHS Trust*
Professor Ian Booth	*Professor of Child Health, Birmingham*
Mr Perry Burgess	*Community Dietitian, Borders Health Board*
Dr Deborah Christie	*Department of Child and Adolescent Psychological Services, London*
Professor Tim Cole	*Paediatric Epidemiology and Biostatistics, Institute of Child Health, London*
Dr Peter Craig	*Research Manager, Chief Scientist Office, Edinburgh*
Dr William Dietz	*National Center for Chronic Disease Prevention and Health Promotion Centers for Disease Control and Prevention, USA*
Dr Penny Gibson	*Royal College of Paediatrics and Child Health Adviser and Consultant Paediatrician, London*
Dr Gill Harvey	*Royal College of Nursing Institute, Oxford*
Professor Roland Jung	*Chief Scientist, Scottish Executive, Edinburgh*
Ms Clare Keenan	*Dietitian, Tweed Horizon Centre, Melrose*
Dr Margaret Lawson	*Senior Research Fellow, Institute of Child Health, London*
Professor Mike Lean	*Professor of Human Nutrition, Glasgow Royal Infirmary*
Dr Adrian Lodge	*Consultant Psychiatrist, Edinburgh*
Dr Anita MacDonald	*Head of Research Dietetics, Birmingham Children's Hospital.*
Ms Carole Noble	*Community Dietitian, Royal Cornhill Hospital, Aberdeen*
Ms Sue O'Meara	*Research Fellow, University of York*
Dr Noelle O' Neil	*Clinical Effectiveness Co-ordinator, Highland Health Board, Inverness*
Professor Andrew Prentice	*Head, MRC International Nutrition Group, London*
Professor Lawrence Weaver	*Professor of Child Health, Royal Hospital for Sick Children, Glasgow*

Two general practitioners were also invited to review the draft guideline, but did not submit any comments.

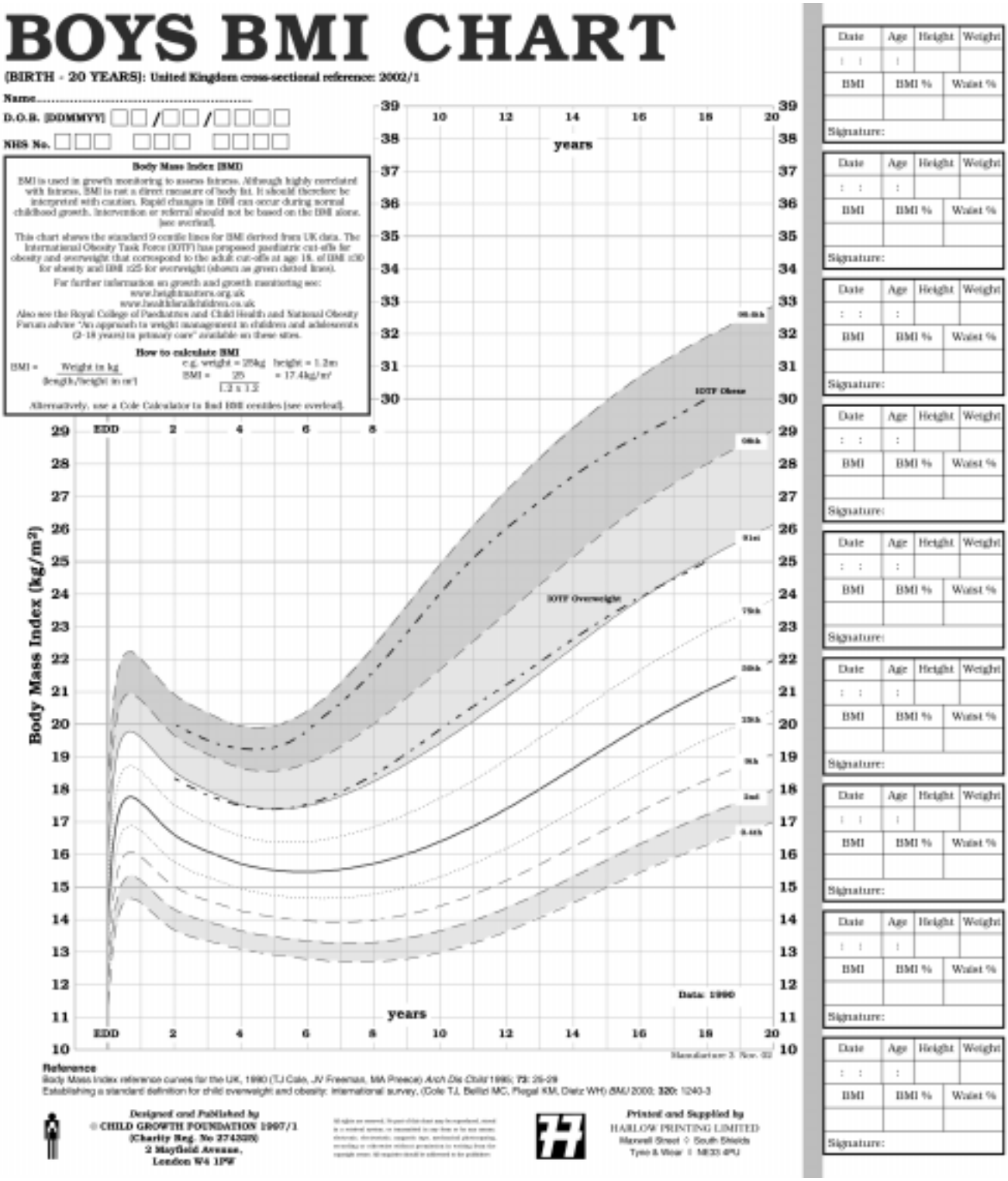
7.4.3 SIGN EDITORIAL GROUP

As a final quality control check, the guideline is reviewed by an Editorial Group including the relevant specialty representatives on SIGN Council to ensure that the peer reviewers' comments have been addressed adequately and that any risk of bias in the guideline development process as a whole has been minimised. The Editorial Group for this guideline was as follows:

Dr Keith Brown	*Royal College of Psychiatrists*
Professor Gordon Lowe	*Chairman of SIGN, Co-editor*
Dr Lesley Macdonald	*Faculty of Public Health Medicine*
Dr Sara Twaddle	*Director of SIGN, Co-editor*
Dr Peter Wimpenny	*National Nursing, Midwifery and Health Visiting Advisory Committee*

Each member of the guideline development group then approved the final guideline for publication.

Annex 1



BOYS BMI CHART

(BIRTH - 20 YEARS): United Kingdom cross-sectional reference: 2002/1

Name.....

D.O.B. [DDMMYY] ☐☐/☐☐/☐☐☐☐

NHS No. ☐☐☐ ☐☐☐ ☐☐☐☐

Body Mass Index (BMI)

BMI is used in growth monitoring to assess fatness. Although highly correlated with fatness, BMI is not a direct measure of body fat. It should therefore be interpreted with caution. Rapid changes in BMI can occur during normal childhood growth. Intervention or referral should not be based on the BMI alone. [see overleaf].

This chart shows the standard 9 centile lines for BMI derived from UK data. The International Obesity Task Force (IOTF) has proposed paediatric cut-offs for obesity and overweight that correspond to the adult cut-offs at age 18, of BMI ≥30 for obesity and BMI ≥25 for overweight (shown as green dotted lines).

For further information on growth and growth monitoring see:
www.heightmatters.org.uk
www.healthforallchildren.co.uk
Also see the Royal College of Paediatrics and Child Health and National Obesity Forum advice "An approach to weight management in children and adolescents (2-18 years) in primary care" available on these sites.

How to calculate BMI

BMI = Weight in kg / (height/height in m²)

e.g. weight = 25kg height = 1.2m

BMI = 25 / 1.2 x 1.2 = 17.4kg/m²

Alternatively, use a Cole Calculator to find BMI centiles [see overleaf].

Body Mass Index (kg/m²)

years

EDD 2 4 6 8 10 12 14 16 18 20

IOTF Obese

IOTF Overweight

98.8th

91st

75th

50th

25th

9th

2nd

0.4th

Data: 1990

Reference

Body Mass Index reference curves for the UK, 1990 (TJ Cole, JV Freeman, MA Preece) *Arch Dis Child* 1995; **73**: 25-29

Establishing a standard definition for child overweight and obesity: international survey. (Cole TJ, Bellizi MC, Flegal KM, Dietz WH) *BMJ* 2000; **320**: 1240-3

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GIRLS BMI CHART

(BIRTH - 20 YEARS): United Kingdom cross-sectional reference: 2002/1

Name.....

D.O.B. [DDMMYY] ☐☐/☐☐/☐☐☐☐

NHS No. ☐☐☐ ☐☐☐ ☐☐☐☐

Body Mass Index (BMI)

BMI is used in growth monitoring to assess fatness. Although highly correlated with fatness, BMI is not a direct measure of body fat. It should therefore be interpreted with caution. Rapid changes in BMI can occur during normal childhood growth. Intervention or referral should not be based on the BMI alone. [see overleaf].

This chart shows the standard 9 centile lines for BMI derived from UK data. The International Obesity Task Force (IOTF) has proposed paediatric cut-offs for obesity and overweight that correspond to the adult cut-offs at age 18, of BMI ≥30 for obesity and BMI ≥25 for overweight (shown as green dotted lines).

For further information on growth and growth monitoring see:
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Also see the Royal College of Paediatrics and Child Health and National Obesity Forum advice "An approach to weight management in children and adolescents (2-18 years) in primary care" available on these sites.

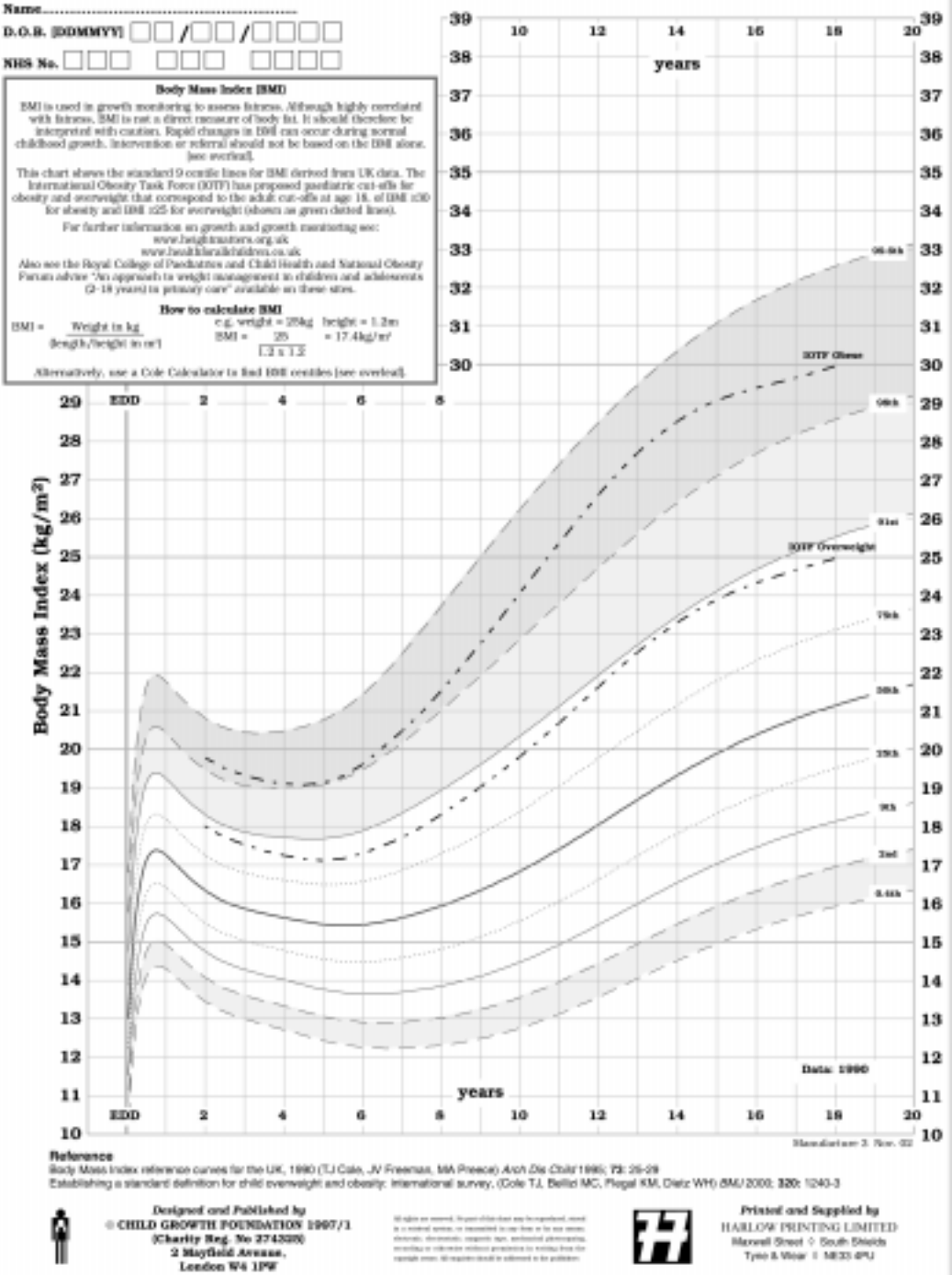
How to calculate BMI

$$BMI = \frac{\text{Weight in kg}}{(\text{height/height in m}^2)}$$

e.g. weight = 25kg height = 1.2m

$$BMI = \frac{25}{1.2 \times 1.2} = 17.4 \text{kg/m}^2$$

Alternatively, use a Cole Calculator to find BMI centiles [see overleaf].



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Annex 2 Healthy eating and changing behaviours

HEALTHY EATING ADVICE FOR CHILDREN

The guidance presented in this annex is based upon the work of many experts (referenced in the text) and should be considered equivalent to grade D recommendations.

BIRTH TO 5 YEARS

Breast milk is the food of choice for newborn infants as it offers significant health benefits for babies, for example, reduced risk of respiratory, gastrointestinal, urinary tract and ear infections, allergy and asthma.[112-115] Introduction of solid foods should be avoided until infants are at least four to six months of age.[116,117] Weaning is best done gradually, starting with small amounts of pureed fruit or vegetables, or rice or other gluten free cereal.

From six months the range of foods offered should be gradually increased. To ensure children up to the age of two consume adequate energy for growth and development in relatively small volumes of food, full fat versions of dairy products are recommended and starchy foods very high in fibre should be avoided. From two years gradual introduction of low fat dairy products should be considered for children who are growing well and eating a varied diet, so that by the age of five most children are eating in accordance with the 'Eating for Health' plate model. Children from approximately one year would normally be expected to eat three meals a day and two between-meal snacks. Foods particularly high in fat and sugar are not necessary.

Further information on nutrition from birth to 5 years is available in HEBS paper *Evidence into Action: Nutrition in the Under Fives* (www.hebs.com/research/pd)

This link was correct at the time of publication, but please check the SIGN website for updates.

Patient information leaflets about breastfeeding and weaning are available from the health promotion department of the local NHS Board and local paediatric dietetic department. Patient information leaflets are also available from the Paediatric Group of the British Dietetic Association, c/o 5th Floor, Charles House, 148/9 Great Charles Street, Queensway, Birmingham B3 3HT.

CHILDREN OVER 5

The figure overleaf makes healthier eating easier to understand by showing the types and proportions of foods needed to make a well balanced and healthy diet. The patient, parents and health visitor or dietitian should discuss it.

This model applies to children over the age of five years, as well as to adults. It is recommended that foods eaten over a day be consumed in the relative proportions set out on the plate. In other words, approximately one third of a child's intake by volume should comprise starchy carbohydrate foods, one third fruits and vegetables, with smaller amounts of foods from the meat, fish and alternatives group and low fat dairy products. Although not necessary for good health, fatty, sugary foods in small amounts can be part of a normal healthy diet. It is also important that fluid intake is adequate. Suitable drinks are water, low fat milk, very well diluted low calorie diluting juices and diluted fruit juice.

The following guidelines reflect the core elements of healthy eating and can be used to complement the "Eating for Health" plate model:

- *Eat regularly*
- *Include bread, pasta, cereals, rice or potatoes at every meal*
- *Eat some form of fruit and vegetables at each meal*
- *Limit foods high in sugar such as sweets and chocolate*
- *Limit foods high in fat such as crisps, chips and pastries*
- *Limit fried foods (including deep fried foods).*

Figure 1: The 'Eating for Health' plate model

ADVICE ON CHANGING EATING BEHAVIOURS FOR CHILDREN AND THEIR FAMILIES

The way in which food is provided and used is also important. The following advice should be provided, as appropriate, according to existing behaviours of the child/family in question, and at the discretion of the individual health professional:

- Take plenty of exercise and limit time spent watching TV or playing computer games
- Provide meals and snacks at regular times; avoid grazing all day long
- Separate eating from other activities such as watching TV or doing schoolwork
- Offer healthy options but agree one to two treats a week
- Encourage the child to listen to internal hunger cues and to eat to appetite
- Instead of offering food as a reward to a child, try alternatives such as giving stickers, going to the cinema, a new book or toy, or having a friend to stay overnight
- Comfort with attention, listening and hugs instead of food
- Ask for help from friends and family in supporting behaviour changes
- Keep foods that the child should be avoiding out of the house
- Avoid classifying foods as good or bad
- The approach a parent takes to a child's behaviour should always be consistent.

Further practical information for health professionals about healthy eating for children who are overweight or obese is available from the HEBS website: www.hebs.com/learningcentre/weightmanagement. Leaflets that have been produced by dietitians nationally will be available from Scottish Nutrition & Diet Resources Initiative by spring 2003. For further information please contact Alison Horne, Project Co-ordinator at Alison.Horne@gcal.ac.uk or visit the website at www.sndri.gcal.ac.uk

Activity and inactivity levels are important. Children should be encouraged to be less inactive by restricting the amount of time spent on the telephone, watching TV and playing computer games to less than two hours per day.[11]

ADVICE ON INCREASING PHYSICAL ACTIVITY

Children should be encouraged to be more physically active and aim for an average of 30 minutes of physical activity per day.[104]

This may include:

- walking instead of taking the bus
- using stairs instead of escalators or lifts
- going for walks, visits to parks and playgrounds
- swimming, cycling, rollerblading
- team activities such as football, dancing, Brownies/Cubs and Guides/Scouts
- attending PE lessons/outdoor education.

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DIAGNOSING OBESITY

C **The Body Mass Index percentile should be used to identify childhood obesity.**

$$\text{BMI} = \frac{\text{weight in kilogrammes}}{\text{height in metres}^2}$$

D **Obese children have a BMI ≥98th centile of the UK 1990 reference charts for age and sex**

☑ Overweight children have a BMI ≥91st centile of the UK 1990 reference charts for age and sex

☑ The UK 1990 reference data for BMI in childhood are recommended for clinical and epidemiological practice in the UK

TREATING OBESITY

D **Treatment should only be considered where:**

- **a child is defined obese** (BMI ≥98th centile)
- *and* **the child and family are perceived to be ready and willing to make the necessary lifestyle changes**

☑ Increases in activity, through lifestyle changes and exercise, reduction in energy intake and reduction in sedentary behaviour should be considered for the treatment of obesity

WEIGHT MAINTENANCE

D **In most obese children** *(BMI ≥98th centile)* **weight maintenance is an acceptable goal.**

☑ The benefits of weight maintenance should be demonstrated to families by charting weight over time on the BMI percentile

D **Weight maintenance and/or weight loss can only be achieved by sustained behavioural changes, eg:**

- **healthier eating**
- **increasing habitual physical activity** *(eg brisk walking)* **to a minimum of 30 mins day. In healthy children, 60 minutes of moderate-vigorous physical activity/day has been recommended**
- **reducing physical inactivity** *(eg watching television and playing computer games)* **to < 2 hours/day on average or the equivalent of 14 hours/week.**

Practitioners may be asked to give advice on managing overweight children. As with obese children, weight maintenance is an acceptable goal for children who are overweight.

D **In overweight children** *(BMI ≥91st centile)* **weight maintenance is an acceptable goal. Annual monitoring of BMI percentile may be appropriate to help reinforce weight maintenance and reduce the risk of children becoming obese.**


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